

**RULES
OF
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
BUREAU OF ENVIRONMENT
DIVISION OF AIR POLLUTION CONTROL**

**CHAPTER 1200-3-12
METHODS OF SAMPLING AND ANALYSIS**

TABLE OF CONTENTS

1200-3-12-.01 General	1200-3-12-.03 Source Sampling and Analysis
1200-3-12-.02 Procedures for Ambient Sampling and Analysis	1200-3-12-.04 Monitoring Required for Determining Compliance of Certain Large Sources

1200-3-12-.01 GENERAL.

- (1) It is explicitly implied that in addition to and consistent with specific methods of sampling and analysis described herein, that samples will be taken in such number, duration and location as to be statistically significant and representative of the condition which the sample(s) purport to evaluate.
- (2) Where specific materials, equipment procedures are specified, it shall be permissible to use other materials, equipment or procedures where it has been reliably demonstrated that their use produces results comparable to that which would have been obtained by use of the specified materials, equipment or procedures.

Authority: T.C.A. §53-3412. **Administrative History:** Original rule certified June 7, 1974.

1200-3-12-.02 PROCEDURES FOR AMBIENT SAMPLING AND ANALYSIS.

- (1) The reference method for the sampling and the analytical procedures for sulfur dioxide, total suspended particulates, carbon monoxide, nitrogen dioxide, lead, PM-10 and ozone are found in 40 CFR Part 50, Chapter 1, Subchapter C (7-1-92 Edition) which is incorporated in its entirety by reference. The procedure for sampling and analyzing atmospheric fluorides shall conform with the method adopted by the American Society for Testing Materials and found in the Annual Book of ASTM Standards published each year by the American Society for Testing Materials with a designation of D3266 "Standard Test Method for Automated Separation and Collection of Particulate and Acidic Fluoride in the Atmosphere ("Double Paper Tape Sampler Method")." Persons required to conduct ambient air monitoring may obtain a copy of 40 CFR Part 50, Chapter 1, Subchapter C from the Technical Secretary.
- (2) For those air contaminants which the EPA has established reference and equivalent monitoring methods, the use of alternative sampling procedures shall be approved by the Technical Secretary and EPA. For those air contaminants which the EPA has not established reference and equivalent methods, the use of alternative sampling procedures shall be approved by the Technical Secretary.
- (3) Each owner or operator of an air monitoring network required by the Technical Secretary shall submit in writing to the Technical Secretary a Quality Control/Quality Assurance plan for approval prior to commencing air monitoring. This plan shall be reviewed and approved prior to start-up of new monitoring networks or whenever any significant change is made to an existing network. The Technical Secretary will determine if a change that is made is significant.
- (4) All ambient monitoring data generated by continuous operating monitors shall be submitted on magnetic media in a format acceptable to the Technical Secretary. All ambient monitoring data generated by intermittent sampling techniques shall be submitted in a format acceptable to the Technical Secretary.
- (5) Each ambient monitor sited in the field for the purpose of generating data for the monitoring procedures listed in 1200-3-12-.02(1) must have a valid data recovery of at least 75 percent. Information which

(Rule 1200-3-13-.02, continued)

documents the cause of missing data shall be submitted in writing to the Technical Secretary for all missing data.

Authority: T.C.A. §§53-3412, 68-25-105 and 4-5-202 et. seq. **Administrative History:** Original rule certified June 7, 1974. Amendment filed January 10, 1977; effective February 9, 1977. Amendment filed May 7, 1979; effective June 21, 1979. Amendment filed December 4, 1979; effective January 18, 1980. Amendment filed June 28, 1990; effective August 12, 1990. Amendment filed November 30, 1993; effective February 13, 1994. Amendment filed March 18, 1994; effective June 1, 1994.

1200-3-12-.03 SOURCE SAMPLING AND ANALYSIS.

The methods set forth in this section shall be applicable for determining compliance with emission standards.

- (a) **SAMPLE AND VELOCITY TRAVERSES.** - Sample and velocity traverses shall be determined by Method 1 outlined in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978.
- (b) **STACK GAS VELOCITY DETERMINATION.** - Stack gas velocity shall be determined by Method 2 outlined in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, except in such instances where a Type S pitot tube is not applicable.
- (c) **GAS ANALYSIS.** - Gas analysis for carbon dioxide, oxygen, excess air, and dry molecular weight shall be determined by Method 3 outline in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, or another type of test procedure that is direct indicating and/or recording approved by the Technical Secretary.
- (d) **DETERMINATION OF MOISTURE CONTENT IN STACK GASES.** - Moisture content shall be determined by Method 4 outline in the Federal Register, Volume 42, Number 60, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, or other technique approved by the Technical Secretary.
- (e) **DETERMINATION OF PARTICULATE EMISSIONS.** - The basic design of the sampling train is left to the individual, if certain criteria are observed to assure high collection efficiency and standard analysis of the collected particulates.

1. DESCRIPTION OF SAMPLING APPARATUS.

- (i) This apparatus shall include interchangeable sampling nozzles or probes, of various diameters, a filter effective for the removal of particulates exceeding 0.3 micron diameter of solid or liquid, a suitable number of impingers to reduce condensable vapors to liquid or solid particulate matter, and appropriate connecting tubing at temperatures above the aqueous dewpoint of the gases. All materials of construction shall be resistant to corrosive elements in the flue gases, e.g., SO₂, NO_x and elevated temperatures.
- (ii) This filter assembly shall be maintained above the aqueous dewpoint of the flue gases throughout the sampling operation. To accomplish this, the filter assembly may be disposed inside the gas flue to be completely bathed by the hot gas stream; or it may be disposed outside the gas stream, provided the following precautions are taken.
 - (I) If the filter is disposed outside the hot gas flue, a temperature indicator, e.g., thermocouple, shall be provided at the sample filter gas exit to monitor the filter temperature above the aqueous dewpoint of the flue gases at all times. Auxiliary

(Rule 1200-3-12-.03, continued)

heating elements for tubing and filter holder shall be provided to maintain specified temperatures when required.

- (II) Deposits in the tube connecting the probe to the exterior filter shall be quantitatively removed by washing with a suitable liquid and by brushing, the weight of solids recovered therefrom being added to the weight found in the filter.
 - (iii) Provisions shall be included for cooling the gas stream to standard conditions (70°F) to reduce condensable vapors to liquid or solid particulate matter, and for cooling the condensed particles, including water that may be formed by condensation of water vapor in the sample. This shall be accomplished by passage through bubblers provided with an orifice submerged in water through which the gas stream passes at a velocity of approximately 100 meters per second. The bubblers should be immersed in an ice bath to minimize evaporation. A trap of suitable shape and dimensions for the collection of overflow or overspray shall be provided downstream from the bubblers.
 - (iv) An indicating flowmeter shall be provided and preferably located in the train at a point preceding the source of suction, preceded by a trap to prevent condensed water from entering the flowmeter; and a vacuum gauge adjacent to the flowmeter to indicate the absolute pressure of the gas passing through the orifice meter.
 - (v) Operation charts comprising either graphs or tables shall be prepared and be available as a part of the apparatus, to indicate proper sampling rates as a function of gas density in the stack and at the flowmeter.
- 2. ANALYTICAL RESULTS. Analytical results shall be accomplished as outlined in the appendix of the Federal Register, Volume 36, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, for the filter catch and washings up to the filter. Inclusion or exclusion of material collected in the impinger train as "particulate matter" and method of analysis will be determined on an individual air contaminant source basis.
 - 3. EQUIVALENT METHODS. Those procedures demonstrated to yield equivalent results and approved by the Technical Secretary may be used for sampling and analysis of particulate matter. Stack sampling methods promulgated by the Environmental Protection Agency for specified air contaminant sources are considered to be equivalent methods and therefore acceptable.
- (f) Measurement of Sulfur Dioxide in Stack Gases.
 - 1. The approved procedure for measuring sulfur dioxide in stack gases is the method contained in Chapter 3 of the Tennessee Department of Public Health's January, 1975 edition of the Source Sampling Manual as amended on August 11, 1975.
 - 2. Equivalent Methods. Many new and improved methods of continuous gaseous monitoring in stacks are now in use. Any method of stack sampling approved by the Technical Secretary may be used in accordance with good professional practice. Stack sampling methods promulgated by the Environmental Protection Agency for specified air contaminant sources are considered to be equivalent methods and therefore acceptable.
 - (g) Determination of Sulfuric Acid (H₂SO₄) in Stack Gases. Sulfuric acid in stack gases shall be determined by Method 8 outlined in the *Federal Register*, Volume 42, Number 160, August 18, 1977, as amended in the *Federal Register*, Volume 43, Number 57, March 23, 1978.

(Rule 1200-3-12-.03, continued)

- (h) Determination of Nitrogen Oxides in Stack Gases. Nitrogen oxides in stack gases shall be determined by Method 7 outlined in the *Federal Register*, Volume 42, Number 160, August 18, 1977, as amended in the *Federal Register*, Volume 43, Number 57, March 23, 1978.
- (i) Determination of the Efficiency of Fluoride Control Devices for Potrooms of Primary Aluminum Reduction Plants as follows:
 - 1. The determination shall consist of three sample runs, each of which shall consist of a simultaneous inlet and outlet sample upon the control device or an equivalent test procedure approved by the Technical Secretary. Each sample shall be of eight (8) hours duration and shall contain a minimum of two hundred and forty (240) dry standard cubic feet of air.
 - 2. Other details as to the collection of the samples and their analysis shall be accomplished by either Method 13A or 13B or approved equivalent as outlined in the *Federal Register*, Volume 40, Number 152, August 6, 1975 and as amended in the *Federal Register*, Volume 41, Number 230, November 29, 1976.
 - 3. The average efficiency of each fluoride control device shall be calculated as the average of the three control device collection efficiencies as determined by the three sample runs.
- (j) Determination of Inorganic Lead Emissions in Stack Gases. Lead emissions in stack gases shall be determined by Method 12 outlined in the *Federal Register*, Volume 47, April 16, 1982, pp 16574-16579.

Authority: T.C.A. §68-25-105 et. seq. **Administrative History:** Original rule certified June 7, 1974. Amendment filed March 22, 1976; effective April 21, 1976. Amendment filed March 13, 1978; effective April 12, 1978. Amendment filed October 2, 1979; effective November 16, 1979. Amendment filed December 8, 1981; effective January 22, 1982. Amendment filed July 3, 1984; effective August 1, 1984.

1200-3-12-.04 MONITORING REQUIRED FOR DETERMINING COMPLIANCE OF CERTAIN LARGE SOURCES.

- (1) For a fossil fuel-fired steam generator using solid fuel subject to subparagraph 1200-3-14-.02(1)(d), the source owner or operator may choose the method of measuring sulfur dioxide in the stack gases depending upon the type of fuel burned. No later than 30 days after the effective date of this regulation, the source owner or operator must inform the Technical Secretary by certified mail of the method to be utilized. If no choice is made by that date the owner or operator must monitor using the method outlined in subparagraph (2)(b) of this rule.
- (2) The available sulfur dioxide measurement methods are as follows:
 - (a) If low sulfur coal is the only solid fuel burned, fuel analysis procedures and methods of calculations as prescribed by the Technical Secretary may be used. The purpose of this rule, low sulfur coal is defined as coal containing less than 1.00% sulfur by weight on a dry basis. Determination will be based on records of fuel burning during calendar year 1974. The procedures used to determine if the sulfur content of the fuel meet this 1.00% limitation during this time period will be subject to approval by the Technical Secretary. If the source owner or operator elects this method, the Technical Secretary will specify the data to be submitted to verify that the sulfur content is less than the 1.00% limitation. For facilities that elect to use fuel analysis procedures, fuels are not required to be sampled or analyzed for preparation of reports of compliance until the Technical Secretary specifies the procedures and requirements. If the 1.00% limit is ever exceeded then the method specified in subparagraph (b) of this paragraph must be used for monitoring.

(Rule 1200-3-12-.04, continued)

- (b) Measurement of sulfur dioxide in the stack gases may be accomplished by the installation and operation of a continuous in-stack sulfur dioxide monitoring instrument. The type of monitor and its location will be subject to approval by the Technical Secretary. The in-stack monitoring instrument will be subject to the provisions of paragraph 1200-3-10-.02(1)(f) of these regulations.
- (3) For sulfuric acid plants and liquid sulfur dioxide plants located in a Class I county and existing on January 1, 1979, the measurement of sulfur dioxide in the stack gases must be accomplished by the installation and operation of a continuous in-stack sulfur dioxide monitor. The type of monitor and its location will be subject to approval by the Technical Secretary. The in-stack monitoring instrument will be subject to the provisions of paragraph 1200-3-10-.02(1) of these regulations.
- (4) For recovery furnaces and lime kilns located at kraft mills the measurement of total reduced sulfur compounds in stack gases must be accomplished by the installation and operation of a continuous in-stack total reduced sulfur (TRS) monitor. Such TRS monitor shall be accompanied by a continuous monitoring system for the measurement of the percent oxygen. The type of monitor and its location will be subject to approval by the Technical Secretary. The in-stack monitoring instrument will be subject to the provisions of paragraph 1200-3-10-.02(1) of these regulations.

Authority: T.C.A. §4-5-201 and 68-201-105 et. seq. **Administrative History:** Original rule filed March 13, 1978; effective April 12, 1978. Amendment filed May 7, 1979; effective June 21, 1979. Amendment filed August 26, 1981; effective October 13, 1981. Amendment filed November 12, 1982; effective December 13, 1982. Amendment filed October 14, 1996; effective December 28, 1996.